

Appl. No. 09/945,393

REMARKS

Claims 1-7, 20-24, 26, 27, 35-38, 45-49, and 53-56 are pending in the application. Applicant expresses appreciation for the allowance of claims 20-24, 26, 27, 35, and 45-49.

Claims 53-56 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. Applicant requests reconsideration. In the Preliminary Amendment to Accompany RCE and Response to June 29, 2004 Office Action, Applicant previously stated on page 13 that at least paragraph 35 of the present specification supports the entire subject matter of claims 53-56 that were added as new claims in such amendment. Applicant notes that current claims 53 and 55 incorporate the entire subject matter of previous claims 54 and 56 as added as new claims in such amendment. Accordingly, Applicant asserts that current claims 53 and 55 remain fully supported at least by paragraph 35 of the present specification.

Page 2 of the Office Action alleges that the present specification does not describe "forming 3 layers of dielectric material comprising different metals." On the contrary, paragraph 35 expressly states that "when titanium oxide and zirconium oxide are together combined with Ta₂O₅, about 8% of the monolayers comprise titanium oxide and about 10% [of the monolayers] comprise zirconium oxide." Paragraph 35 further states that "the present discussion describes compositional ranges in terms of the number of monolayers." Accordingly, the present specification fully supports claims 53 and 55. The Office Action does not challenge Applicant's prior assertion that

Appl. No. 09/945,393

at least paragraph 35 supports claims 53 and 55. Applicant asserts that paragraph 35 also supports the subject matter of claims 54 and 56 added by amendment in the Response to August 8, 2005 Office Action. At least for such reasons, Applicant requests withdrawal of the written description rejection in the next Office Action.

Claims 1-7, 36-38, and 53-56 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Raaijmakers. Applicant requests reconsideration.

Claim 53 sets forth a dielectric material forming method that includes, among other features, atomic layer depositing alternated monolayers of a first dielectric material consisting of tantalum and oxygen, a second dielectric material consisting of zirconium and oxygen, and a third dielectric material consisting of titanium and oxygen. Of the monolayers, 8-10% are monolayers of the second material and 5-15% are monolayers of the third material. The method includes annealing the monolayers, the annealed dielectric material exhibiting a dielectric constant greater than the first material and second material and less current leakage than the first material. Pages 3-5 of the Office Action allege that Raaijmakers at least suggests every limitation of 53. Applicant traverses.

It appears that the Office may have misunderstood the meaning of terminology used in Raaijmakers. Applicant previously stated on page 9 of the Response to August 8, 2005 Office Action that Raaijmakers fails to motivate forming a quaternary metal oxide compound, as set forth in claim 53. Page 4 of the Office Action counters Applicant's assertions and other related assertions with the allegation that Raaijmakers discloses "forming

Appl. No. 09/945,393

three layers comprising different metals" in paragraphs 69 and 117. Applicant notes that reference in paragraphs 69 and 117 of Raaijmakers to a "ternary dielectric" means a dielectric containing two metals and oxygen. In comparison, a binary dielectric in Raaijmakers refers to a dielectric containing one metal and oxygen. Such teaching is readily apparent from paragraphs 69 and 117 as well as Figs. 5 and 6 which respectively show binary cycles 115 and ternary cycles 215.

Claim 53 differs from the teachings of Raaijmakers in setting forth a dielectric material forming method for a "quaternary" (in Raaijmaker's terms) dielectric containing three metals and oxygen. Applicant asserts that Raaijmakers fails to disclose or suggest the combination of tantalum, titanium, zirconium, and oxygen in the manner claimed or any other dielectric containing three metals and oxygen. Applicant also asserts that the Office Action fails to identify any substantial evidence supported by Raaijmakers of a suggestion of such dielectrics. It is thus apparent that Raaijmakers, in fact, fails to suggest "forming 3 layers comprising different metals," contrary to the allegation in the Office Action.

Pages 4-5 of the Office Action alleges that Raaijmakers suggests the claimed compositional range and that a reasonable expectation of success exists in obtaining the properties recognized by Applicant. The allegations appear to be based on the presumption that Raaijmakers discloses "forming 3 layers comprising different metals." Since such presumption is incorrect, the Office should appreciate the need to reevaluate any conclusion that Raaijmakers suggests 8-10% of the monolayers consisting of zirconium and

Appl. No. 09/945,393

oxygen and 5-15% of the monolayers consisting of titanium and oxygen, as set forth in claim 53. The Office should also appreciate the need to reevaluate any finding that Raaijmakers suggests the claimed annealed dielectric material exhibiting less current leakage than the first dielectric material consisting of tantalum and oxygen, as set forth in claim 53.

A fundamental requirement placed upon the Office is to show that the prior art suggests making the claimed composition, reveals a reasonable expectation of success, and suggests every claim limitation. Applicant at least asserts that Raaijmakers does not suggest every claim limitation, but it must. It is not an optional requirement. Applicant refers the Office to the law set forth in In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, (Fed. Cir. 2000), which addresses an issue of the present rejection. Namely, the issue is whether a person of ordinary skill, with no knowledge of the claimed invention, would select the specific three different dielectric materials, the specific percentages of two of the dielectric materials, and combine them into a method for forming a dielectric material that achieves an unexpected advantage of decreasing current leakage.

In re Kotzab states that extreme caution must be exercised in determining the knowledge of those of ordinary skill at the time of invention, guided only by the prior art, especially in cases where the invention may be easily understood. Id. at 1369. Otherwise, one may fall victim to basing rejection upon knowledge gleaned only from the Patentee's own disclosure. Id. at 1369. Even though every element of an invention may be found in the prior art, "identification in the prior art of each individual part claimed is

Appl. No. 09/945,393

insufficient to defeat patentability of the whole claimed invention.” *Id.* at 1370. Instead, obviousness based upon combining elements requires some suggestion or motivation “of the desirability of making the specific combination that was made by the applicant,” even when relying upon a single reference. *Id.* at 1370.

The suggestion or motivation may be explicit or implicit, that is, implied or understood but not directly expressed. Establishing an implicit suggestion or motivation requires considering each implication in the context of the entire reference. *Id.* at 1371. A rejection cannot be predicated on the mere identification of individual components of claim limitations. *Id.* at 1371. “Rather, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components or combination in the manner claimed.” *Id.* at 1371.

Regardless of whether paragraphs 124-127 and 151 of Raaijmakers describe a $\text{TiO}_2/\text{Ta}_2\text{O}_5$ dielectric stack, Raaijmakers fails to recognize the unexpected advantage of including zirconium oxide set forth in paragraphs 24 and 33 of the present specification to preferentially address current leakage. The Office Action does not properly allege the existence of any motivation in Raaijmakers to use three metals. Also, Raaijmakers fails to disclose or suggest the preferred composition ranges set forth in claim 53 and discussed in paragraph 35 of the present specification.

The Office Action relies upon discussion in Raaijmakers’ paragraph 69 of a 3:1 and 1:1 ratio of different metals in a dielectric and a discussion in paragraph 117 of “a slight doping effect” as allegedly suggesting the specific

Appl. No. 09/945,393

compositional ranges set forth in claim 53. Only Applicant's own disclosure identifies the combination of monolayers of tantalum and oxygen, zirconium and oxygen. Thus, the Office Action does not establish the third element of a prima facie case.

Also, only Applicant's own specification reveals a preference for zirconium in reducing current leakage. Applicant notes that paragraph 62 of Raaijmakers summarizes its teachings regarding current leakage. Specifically, Raaijmakers teaches that current leakage is a function of dielectric thickness. Raaijmakers fails to disclose or suggest that current leakage is a function of composition, as discussed in the present specification. Accordingly, those of ordinary skill do not possess a reasonable expectation of success in providing less current leakage by forming the composition set forth in claim 53.

At least for the above reasons, Applicant asserts that claim 53 is patentable over Raaijmakers. Claim 54 depends from claim 53 and is patentable at least for such reason as well as for the additional limitations of such claim not disclosed or suggested.

Claim 55 sets forth an enhanced dielectric material that includes, among other features, alternated, atomic layer deposited monolayers of a first dielectric material consisting of tantalum and oxygen, a second dielectric material consisting of zirconium and oxygen, and a third dielectric material consisting of titanium and oxygen. Of the monolayers, 8-10% are monolayers of the second material, 5-15% are monolayers of the third material, and the enhanced dielectric material exhibits less current leakage than the first

Appl. No. 09/945,393

material. Claim 56 depends from claim 55 and sets forth that 10% of the monolayers consist of zirconium and oxygen and 8% of the monolayers consist of titanium and oxygen. As may be appreciated from the discussion above regarding the deficiencies of Raaijmakers as applied to claims 53 and 54, Raaijmakers fails to disclose or suggest every limitation of claims 55 and 56.

Claim 1 sets forth a dielectric material forming method that includes, among other features, forming a second monolayer on a first monolayer, where one contains tantalum and oxygen and the other contains oxygen and zirconium. The method includes forming a dielectric layer containing the first and second monolayers with 5-15% of the dielectric layer being the other monolayer. The dielectric layer exhibits a dielectric constant greater than the first monolayer and second monolayer.

In comparison to amended claim 53, Applicant notes that claim 1 lacks some of the limitations argued as distinguishing Raaijmakers. However, Applicant asserts that the fewer limitations of claim 1 nevertheless distinguish Raaijmakers. Namely, Raaijmakers' motivation to produce enhanced dielectric properties coupled with random experimentation guided by dielectric materials disclosed only individually in Raaijmakers is not sufficient to suggest that those of ordinary skill form a combination of such materials with the claimed compositional range. Also, Raaijmakers does not reveal that those of ordinary skill have a reasonable expectation of success to produce the claimed dielectric constant using the composition set forth in claim 1. Mere disclosure of metal ratios of 3:1 and 1:1 along with discussion of a

Appl. No. 09/945,393

"slight doping effect" is not sufficient given the unpredictability in the chemical arts. Accordingly, claim 1 is patentable over Raaijmakers. Claims 2-7 depend from claim 1 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested.

Claim 36 sets forth a dielectric layer that includes, among other features, a first monolayer containing tantalum and oxygen and a second monolayer containing oxygen and zirconium with 5-15% of the dielectric layer being oxygen and zirconium. The dielectric layer exhibits a dielectric constant greater than the first monolayer and second monolayer. As may be appreciated from the discussion above regarding the deficiencies of Raaijmakers as applied to claim 1, Raaijmakers fails to suggest every limitation of claim 36. Claims 37 and 38 depend from claim 36 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested.

Applicant herein establishes adequate reasons supporting patentability of claims 1-7, 36-38, and 53-56 and requests allowance of all pending claims in the next Office Action.

Respectfully submitted,

Dated: 20 Apr 2006

By: _____

James E. Lake
Reg. No. 44,854